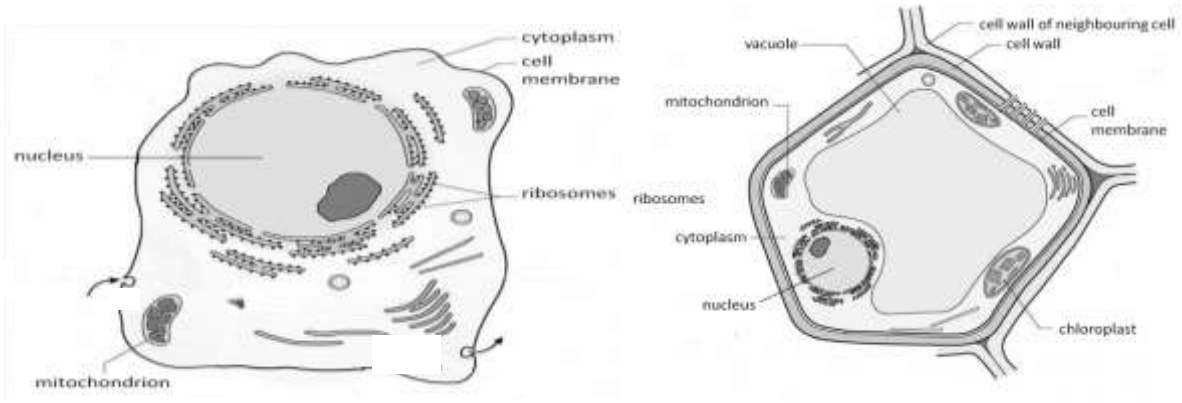
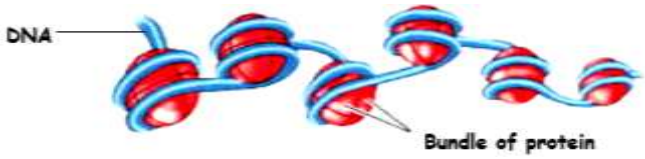
1.1(a) Organisation of DNA

DNA is present in the cells of every living thing. However, the DNA is organised differently in different types of organisms.

Eukaryotes

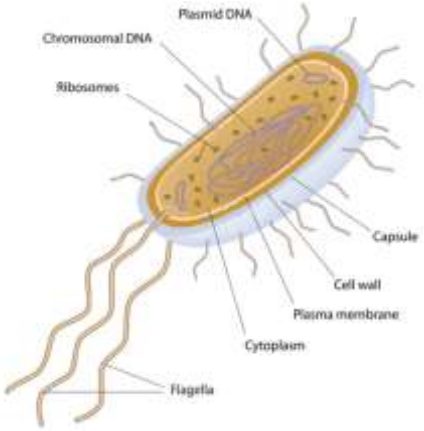


Animals, plants and fungi are eukaryotes. Eukaryotes DNA is stored mainly in the nucleus of the cell in **linear chromosomes**. The DNA in linear chromosomes is tightly **coiled** and **packaged** with associated **proteins**, in order to fit them into the nucleus and prevent them tangling.



However, some DNA can be found as small **circular chromosomes** in **mitochondria** and **chloroplasts** of eukaryotes.
Some **yeast cells** can also contain **circular** plasmids.

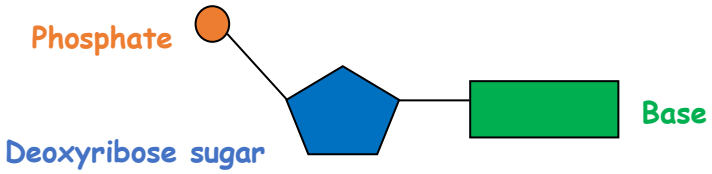
Prokaryotes



Bacteria are prokaryotes. Bacteria do not have a nucleus and thus their DNA is free in the cytoplasm. The genetic material of a bacterial cell is found as a large **circular** chromosome, as well as smaller circular rings of DNA called **plasmids**.

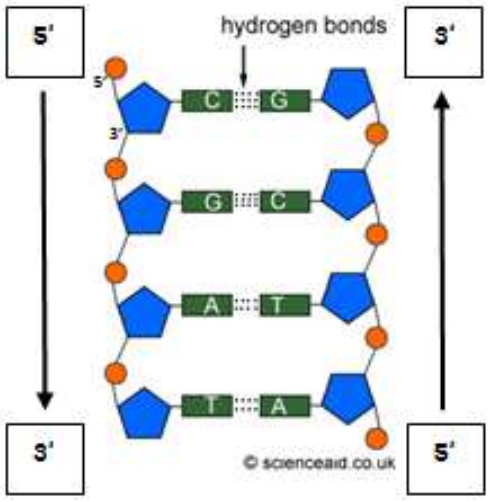
1.1(b) The structure of DNA

A molecule of DNA consists of **two** strands each composed of repeating units called **nucleotides**.
Each DNA nucleotide consists of a molecule of **deoxyribose sugar** joined to a **phosphate** group and an organic **base**.



There are **four** types of **nucleotides** since there are **four** different **bases** (adenine, thymine, guanine and cytosine).

These DNA nucleotides are linked together to form strands by strong **covalent** bonds between the **phosphate group** of one nucleotide and the 3' carbon of the next nucleotide. These strong bonds form a **sugar-phosphate backbone**.



The two strands of nucleotides become joined together by weak **hydrogen bonds** forming between their bases. However, these hydrogen bonds can be broken when it becomes necessary for the two strands to separate (during DNA replication). Due to the shape of the bases and the type of bonding which occurs, only certain base pairing is possible:

adenine (A) always bonds with thymine (T) and
guanine (G) always bonds with cytosine (C).

In order for the base pairs to align with each other, the sugar-phosphate backbones of the two strands have to run in opposite directions, and are described as being **antiparallel strands**, with the deoxyribose sugar at the 3' ends and the phosphate at the 5' ends of each strand, forming a double stranded helix.